

What is claimed is:

1. A positioning apparatus, wherein

a plug member (12) inserted into a positioning hole (5) formed in a second block (2) is projected from a first block (1),

5 a plurality of slide portions (61, 61) opposed to each other across the plug member (12) are arranged around the plug member (12) movably in a first radial direction (D1) substantially orthogonal to the opposed direction thereof,

a first pressing member (15) is arranged outside the slide portions (61, 61) diametrically expandably and diametrically contractibly and axially movably within a  
10 predetermined range,

a second pressing member (19) is arranged outside the slide portions (61, 61) and inside the first pressing member (15) diametrically expandably and diametrically contractibly and axially movably within a predetermined range, and

the first pressing member (15) or the second pressing member (19) is driven  
15 toward a base end by a drive means(D), whereby the slide portions (61, 61) expand the first pressing member (15) in a second radial direction (D2) different from the first radial direction (D1), thereby the slide portions (61, 61) are moved in the first radial direction (D1) with respect to the plug member (12).

2. The positioning apparatus as set forth in claim 1, wherein

20 an inclined outer surface (13) is formed on the second pressing member (19),

an inclined inner surface (17) allowed to make a tapering engagement with the inclined outer surface (13) is formed on the first pressing member (15),

a drive member (21) is inserted into the plug member (12) axially movably, and the drive member (21) is connected to the first pressing member (15) or the second  
25 pressing member (19),

the drive member (21) moves the first pressing member (15) or the second

pressing member (19) toward the base end for locking to expand the first pressing member (15) in the second radial direction (D2) by the tapering engagement and bring the first pressing member (15) into close contact with an inner peripheral surface of the positioning hole (5), and

5           the drive member (21) also moves the first pressing member (15) or the second pressing member (19) toward a leading end for releasing to cancel the diametrically expanded condition of the first pressing member (15) and cancel the closely contacted condition.

3.       The positioning apparatus as set forth in claim 1, wherein

10           an advancing means (69) which advances the first pressing member (15) or the second pressing member (19) toward a leading end is provided.

4.       A positioning apparatus, wherein

          a plug member (12) inserted into a positioning hole (5) formed in a second block (2) is projected from a first block (1),

15           a plurality of slide portions (61, 61) opposed to each other across the plug member (12) are arranged around the plug member (12) movably in a first radial direction (D1) substantially orthogonal to the opposed direction thereof and axially movably within a predetermined stroke,

          a pressing member (15) is arranged outside the slide portions (61, 61) diametrically expandably and diametrically contractibly and axially movably, and

20           the pressing member (15) is driven toward a base end by a drive means(D), whereby the slide portions (61, 61) diametrically expand the pressing member (15) in a second radial direction (D2) different from the first radial direction (D1), thereby the slide portions (61, 61) are moved in the first radial direction (D1) with respect to the plug member (12).

5.       The positioning apparatus as set forth in claim 4, wherein

inclined outer surfaces (13) are formed on the slide portions (61, 61),

an inclined inner surface (17) allowed to make a tapering engagement with the inclined outer surfaces (13) is formed on the pressing member (15),

a drive member (21) is inserted into the plug member (12) axially movably, and

5 the drive member (21) is connected to the pressing member (15),

the drive member (21) moves the pressing member (15) toward the base end for locking to expand the pressing member (15) in the second radial direction (D2) by the tapering engagement and bring the pressing member (15) into close contact with an inner peripheral surface of the positioning hole (5), and

10 the drive member (21) also moves the pressing member (15) toward a leading end for releasing to cancel the diametrically expanded condition of the pressing member (15) and cancel the closely contacted condition.

6. The positioning apparatus as set forth in claim 4, wherein

an advancing means (69) which advances the slide portions (61, 61) toward a leading end is provided.

7. The positioning apparatus as set forth in claim 1 or Claim 4, wherein

the first pressing member or pressing member (15) is formed into an annular shape.

8. The positioning apparatus as set forth in claim 7, wherein

20 a slit (51) is formed in the first pressing member or pressing member (15), and

the first pressing member or the pressing member (15) is allowed to deform in a diametrically expanding direction and a diametrically contracting direction by existence of the slit (51).

9. The positioning apparatus as set forth in claim 1, wherein

25 the second pressing member (19) is formed into an annular shape.

10. The positioning apparatus as set forth in claim 9, wherein

a slit (57) is formed in the second pressing member (19), and the second pressing member (19) is allowed to deform in a diametrically expanding direction and a diametrically contracting direction by existence of the slit (57).

11. The positioning apparatus as set forth in claim 9, wherein

gaps (A, A) are formed between the second pressing member (19) and the plug member (12) in the first radial direction (D1).

12. The positioning apparatus as set forth in claim 1 or claim 4, wherein

the first pressing member or the pressing member (15) is formed into a block shape and arranged so as to oppose each other across the slide portions (61, 61) in plurality.

13. The positioning apparatus as set forth in claim 12, wherein

two contact portions (61a, 61a) allowed to come into contact with an inner surface of the first pressing member or pressing member (15) and escape portion (61b) arranged between the two contact portions (61a, 61a) are formed on an outer surface of each of the slide portions (61) circumferentially side by side, and

a gap (C) is formed between the escape portion (61b) and the first pressing member or pressing member (15).

14. The positioning apparatus as set forth in claim 12, wherein

two contact portions (15a, 15a) and an escape portion (15b) arranged between the two contact portions (15a, 15a) are formed on an outer surface of each of the first pressing member or pressing member (15) circumferentially side by side, and

when the contact portions (15a, 15a) come into contact with an inner peripheral surface of the positioning hole (5), a gap (B) is formed between the escape portion (15b) and the inner peripheral surface of the positioning hole (5).

15. The positioning apparatus as set forth in claim 12, wherein

a cylindrical connecting member (81) is arranged around an outer periphery of

the plug member (12), and

the first pressing member or pressing member (15) is supported on the connecting member (81) movably in the second radial direction (D2).

16. The positioning apparatus as set forth in claim 12, wherein

5 a returning member (84) which applies diametrically contracting force to the first pressing member or pressing member (15) is provided.

17. The positioning apparatus as set forth in claim 1 or claim 4, wherein

the drive means (D) moves the second block (2) toward a base end via the first pressing member or pressing member (15) in such a condition that the first pressing member or pressing member (15) comes into close contact with an inner peripheral surface of the positioning hole (5), and presses a supported surface (2a) of the second block (2) against a support surface (1a) of the first block (1).

18. A clamping system, wherein

the positioning apparatus as set forth in claim 1 or claim 4 is provided.

15 19. A clamping system, wherein

a plurality of positioning apparatuses are provided, and at least one of them is the positioning apparatus as set forth in claim 1 or claim 4.